SAND2019-8004D

Object Detection on Intel's Neural Compute Stick

Spencer Roberts

University of New Mexico
Major: Computer Science
Expected Graduation: 2021

Manager: Scott Brooks
Mentor: Gabe Birch
Org: 6514

Sandia National Laboratories/NM, U.S. Department of Energy
July 24, 2019

Abstract:

The objective of this project is to have You Only Look Once (YOLO) working in real time with a camera and Intel's Neural Compute Stick (NCS). In order for YOLO to work on the NCS, the original darknet YOLO weights and class names has to be converted into the required format for the NCS. The NCS is able to consistently achieve two frames per second while doing inference. Although real time object detection has yet to be achieved, latency is currently only four seconds.

Introduction:

YOLO is an extremely useful tool to use when performing object detection. Once an image or video passes through YOLO, it will provide bounding boxes around all of the objects in frame along with the names of the objects and the percentage of how sure it is that object. YOLO is trained on a set of 80 class names to identify objects, though it is possible to train YOLO to recognize more. The NCS has neural networking capabilities, and is used to decrease the amount of time it takes to perform inference on images and videos. In the near future, YOLO will be able to work with the NCS to provide inference in real time.

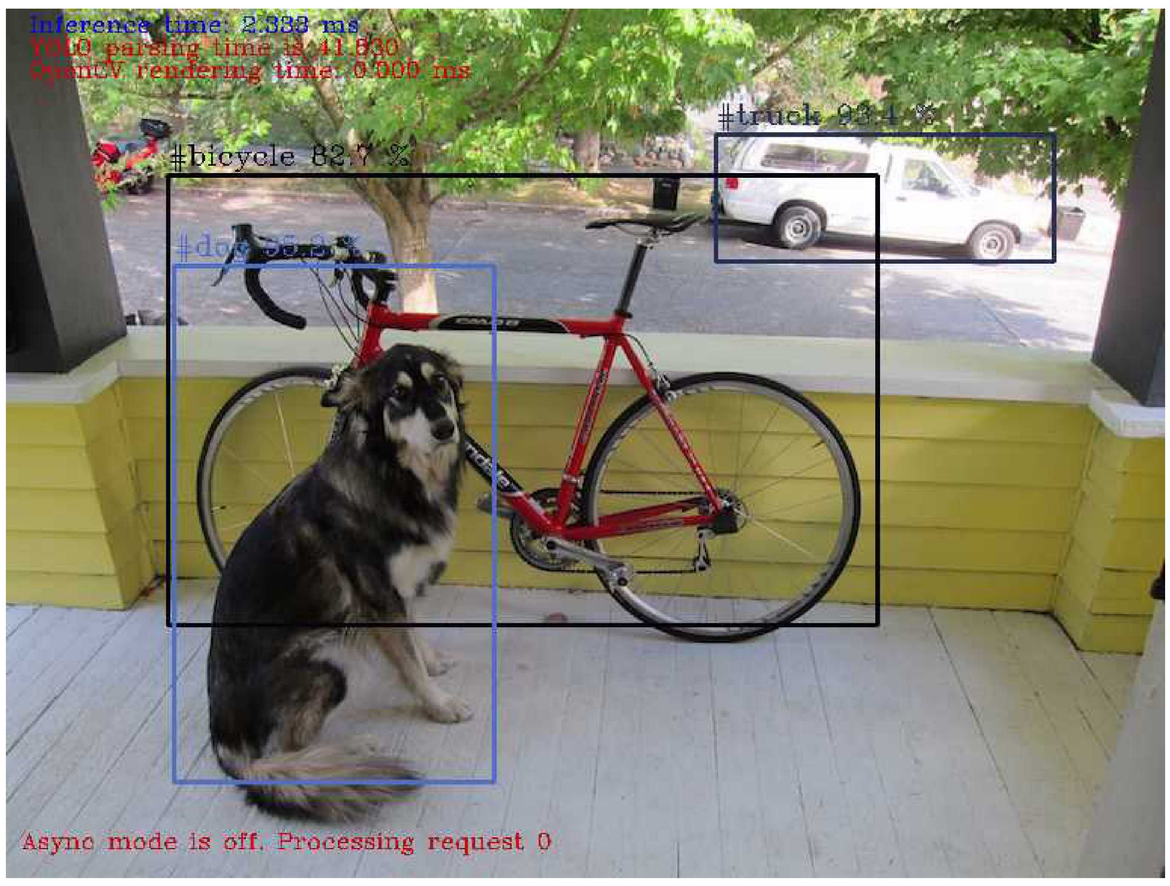
Method:

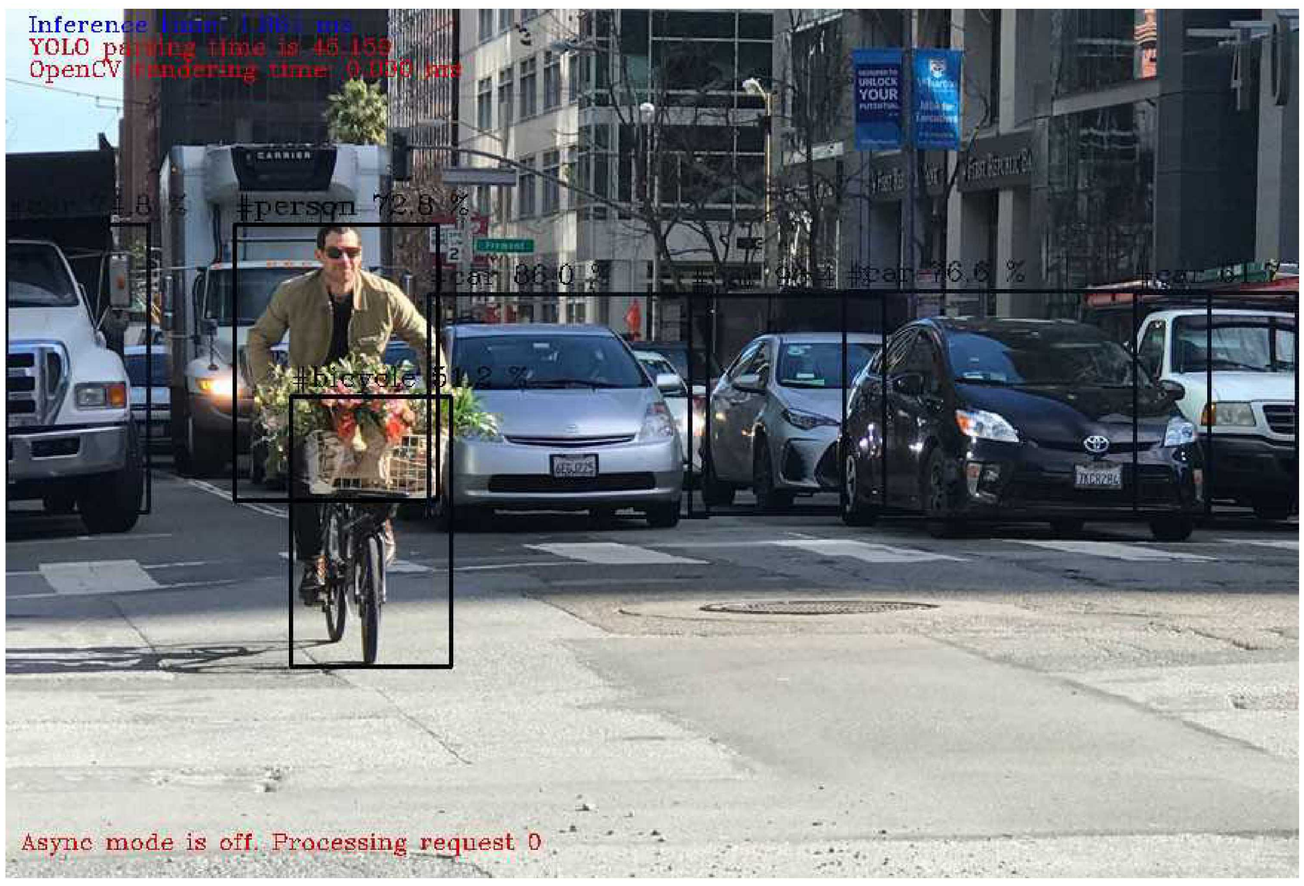
The toolkit for the NCS needs the darknet pre-trained weights and name files to be converted into the required format so they can be properly used. Once this is done, there is a python script that needs to be run with parameters for the paths for the image/video to run inference on, and the converted weights file. While running the python script, the NCS will run YOLO on the image/video and will display the image/video with an overlay with information on inference time.

U.S. DEPARTMENT OF ENERGY

National Nuclear Security Administration

Sandia National Laboratories is a multimission laboratory managed and operated by National Technology and Engineering Solutions of Sandia, LLC., a wholly owned subsidiary of Honeywell International, Inc., for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA-0003525. SAND #





Results:

While testing YOLO on many different videos with various types of resolutions, the NCS was able to steadily maintain two frames per second. The NCS is able to accurately run YOLO on the video from the camera, while also maintaining two frames per second. Although the NCS is not yet able to perform inference in real time, it is very close, with a delay of only four seconds.

Discussion:

Even though YOLO is not currently working in real time on the NCS, it can still be very useful. One possibility to achieve real time is to use Tiny YOLO, which is very similar to YOLO, but with less layers to examine. This will decrease the amount of time it takes to detect objects, however with a decreased amount of time, the accuracy also decreases.

U.S. DEPARTMENT OF ENERGY

National Nuclear Security Administration

Sandia National Laboratories is a multimission laboratory managed and operated by National Technology and Engineering Solutions of Sandia, LLC., a wholly owned subsidiary of Honeywell International, Inc., for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA-0003525. SAND #